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Summary of 1988 Coho Salmon Smolt Trapping Operations on the Lachmach River and Antigonish Creek, British Columbia

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ABSTRACT

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A welded aluminum smolt fence was used to capture smolts at the mouth of the Lachmach River, east of Prince Rupert, British Columbia, between April 26 and May 31, 1988. In total 880 small and 9,103 large coho smolts were trapped. Of these 751 small and 8,441 large smolts were coded wire tagged and adipose fin clipped. Four cutthroat trout, 351 Dolly Varden, 103 rainbow trout, 175 sculpins and 1 oolichan were also captured.

Juvenile coho were trapped and marked in a head water pond area of Antigonish Creek in April 1988. Marked coho smolts were recaptured in a Fyke net located just below the tidal boundary in May 1988. In total, 244 coho were marked. The Fyke net trapped 465 coho smolts, 40 of which had been top caudal clipped. The total smolt production was estimated using the Peterson Method to be 2,784. Nineteen cutthroat trout, 89 Dolly Varden, 15 sculpins, 7 lamprey, 9 rainbow trout, 14 sticklebacks and one adult steelhead were also trapped.

RÉSUMÉ

Finnegan, B. 1991. Summary of 1988 Coho salmon smolt trapping operations on the Lachmach River and Antigonish Creek, British Columbia. Can. Data Rep. Fish. Aquat. Sci. 844: 29 p.

Une barrière en aluminium soudé a été utilisée pour capturer des smolts à l'embouchure de la rivière Lachmach, à l'est de Prince Rupert en Colombie-Britannique, du 26 avril au 31 mai 1988. Au total, 880 petits et 9 103 gros smolts ont été capturés dont 751 et 8 441, respectivement, ont été marqués au moyen de micromarques magnétisées codées; la nageoire adipeuse de ces smolts marquées a aussi été coupée. Quatre truite fardée, 351 Dolly Varden, 103 truites arc-en-ciel, 175 chabots et 1 eulakane ont également été capturés.

Dans une deuxième étude, 244 cohos juvéniles ont été capturés et marqués en avril 1988 dans les eaux de tête du ruisseau Antigonish, dans un secteur où se trouvent des étangs. À la recapture, en mai 1988, 465 smolts ont été capturés au moyen d'un verveux placé juste sous la ligne de marée; de ce nombre, 40 avaient la partie supérieure de leur caudale coupée. La production totale de smolts a été évaluée à 2 784 au moyen de la méthode de Peterson. Dix-neuf truites fardées, 89 Dolly Varden, 15 chabots, 7 lamproies, 9 truites arc-en-ciel, 14 épinoches et une truite arc-en-ciel anadrome adulte ont aussi été capturés.

LACHMACH RIVER PROJECT

INTRODUCTION

The Lachmach River project is part of the Northern Coho Salmon Research Program. It was initiated to obtain information on the productivity of coho salmon (Oncorhynchus kisutch) stocks in British Columbia. The Lachmach River is located 23 km east of Prince Rupert, British Columbia, at the head of Work Channel (Fig. 1). The data presented here are the results of coho smolt trapping and coded wire tagging activities and juvenile coho sampling conducted in the spring of 1988.

METHODS

A permanent cedar fence deck with abutments was installed in the summer of 1987 at the mouth of the Lachmach River. A welded aluminum smolt fence designed by K. Simpson (Pacific Biological Station, Nanaimo, B.C.) was installed on this deck in the early spring of 1988. The fence was in operation from April 26 to May 31, 1988.

The fence consists of five V shaped sections made of aluminum A-frames and screens (Plate 1). The 2 m high A-frames are bolted to the fence deck at a 30^0 angle. The area between each A-frame is covered by six screens. Each screen is a 1 m x 0.65 m frame covered with 0.64 cm (1/4 inch) hardware cloth. There are a total of 140 standard screens. Because of the 30° angle specially designed end screens are required on the upstream end of each V. The downstream ends of three of the V shaped sections are closed off with 3/4 inch plywood. A short length of 8 inch PVC pipe goes from a hole in the plywood downstream to a trap box. The downstream ends of the two remaining sections have triangular Fyke style nets leading from the fence downstream to a holding box.

Smolts trapped at the fence were counted daily. Before being sampled and tagged, fish were anaesthetized with 2-phenoxyethanol and sorted into 2 groups, small and large, based on length and eye diameter. Smolts with eye diameters greater than 6.3 mm and fork lengths of 85 mm or greater were classified as large and thought to have been and at least 2 years old. The fork length of each smolt was recorded, and a representative sample of weights, horizontal eye diameters and scales for age determination were collected. All smolts were then adipose fin clipped and tagged with standard coded wire tags (Northwest Marine Technology, tagging machine model Mark II). Tag codes were 2458 and 2457 for large smolts and 2456 for small smolts.

A sample of fish tagged each day were held for 24 hours and checked for tag loss. All fish that had lost tags were retagged before release.

Juveniles sampled in March and April 1988 were captured using Gee traps baited with salted salmon roe. The traps were set and allowed to soak for 24 hours before being checked. Before sampling the fish were anaesthetized with 2-phenoxyethanol. The fork length of each fish was measured, and representative samples of weights and eye diameters were collected.

Precipitation was measured four times per day using a 127 mm rectangular rain gauge. Water temperature was also measured four times per day using a hand held alcohol thermometer. Maximum and minimum air temperatures were recorded daily from a minimum-maximum thermometer.

RESULTS

The fence was in operation for 35 days. A total of 880 small and 9,103 large smolts were caught. This includes 36 small and 203 large mortalities. The peak outmigration occurred on May 13 (Fig. 2).

The fence was topped by high water on May 22 and all of the screens that could be removed were taken out. The fence was fishing again by 1030 hours, May 23. No fish were tagged or sampled on May 22, 23 or 24 due to high water and mechanical problems with the tagging machine and generator.

In total 8,441 large and 751 small smolts were released with adipose fin clips. Using the daily tag retention rates (Tables 2 and 3) approximately 8,231 large smolts and 722 small smolts were released with coded wire tags.

To estimate tag loss following release it was assumed that there was negligible tag loss after 24 hours and that retagged fish were as likely to lose their tags as fish tagged for the first time. The expected number of retagged fish which subsequently lost their tags was estimated to be

$$\sum_{i=2}^{n} RT_i \times P_i$$

where i is the day of tagging RT_i is the number of fish retagged on day i and P_i is the proportion of tags lost by fish initially tagged on day i. The resulting estimate for tags lost from retagged large fish with code 2458 is 3, with no retag loss expected from large fish with code 2457. The estimated retag loss from small fish is 4. Therefore in total 8,228 large smolts were

released, 7,741 with tag 2458 and 487 with tag 2457. Seven hundred eighteen small coho smolts were released with code 2456.

The age composition of coho smolts leaving the Lachmach River is unclear. Scales taken from outmigrant smolts in 1988 could not be read accurately due to uncertainty about what constituted an annulus as opposed to a growth check (D. Gillespie, Ageing Lab, Pacific Biological Station,pers. comm.).

Four cutthroat trout (Oncorhynchus clarki clarki), 351 Dolly Varden (Salvelinus malma), 1 Oolichan (Thaleichthys pacificus), 103 rainbow trout (Oncorhynchus mykiss), and 175 sculpins (Cottid sp.) were also captured at the fence (Table 5).

ANTIGONISH CREEK PROJECT

INTRODUCTION

Antigonish Creek flows south west into the Skeena River at a point approximately 20 km east of Prince Rupert, British Columbia (Fig. 1). The data presented here are the results of coho salmon (Oncorhynchus kisutch) smolt trapping activities conducted in the spring of 1988.

METHODS

Juvenile coho were trapped and marked with a top caudal fin clip in a head water pond area of Antigonish Creek (Fig.2) in April 1988. All trapping involved the use of Gee minnow traps baited with salted salmon roe. Soak time was 24 to 48 hours.

All fish were anaesthetized with 2-phenoxyethanol and measured. Representative samples of weights and eye diameters were also taken. All coho juveniles were caudal fin clipped and allowed to recover before being released.

A Fyke net (Conlin and Tutty 1979) with live box was installed at the mouth of Antigonish River just below tidal influence. It fished from May 9 to June 6.

The trap box was emptied daily. All coho smolts were anaesthetized with 2-phenoxyethanol, measured and inspected for caudal clips. Representative samples of weights and eye diameters were taken. All others species trapped were counted and released.

RESULTS

In total 244 juvenile coho were marked in Antigonish Creek pond in April 1988 (Table 6, Fig. 16). In total 465 smolts were trapped at the downstream Fyke net (Table 7). Of these 40 had been top caudal clipped. Figure 14 shows the daily smolt catches. Figure 15 shows the length frequencies of coho smolts in Antigonish Creek.

Total smolt production was estimated using the Peterson Method (Ricker 1975) to be 2,784.

Nineteen cutthroat trout (Oncorhynchus clarki clarki), 89 Dolly Varden (Salvelinus malma), 15 sculpins (Cottus asper), 7 pacific lamprey (Entosphenus tridentatus), 9 rainbow trout (Oncorhynchus mykiss), 14 sticklebacks (Gasterosteus aculeatus) and one adult steelhead (Oncorhynchus mykiss) were also trapped.

ACKNOWLEDGEMENTS

All coded wire tagging and coho smolt sampling at the permanent fence site on the Lachmach River was conducted by Aquatic Resources Ltd., Vancouver, B. C. under contract to the Department of Fisheries and Oceans.

REFERENCES

Conlin, K. and B.D. Tutty. 1979. Juvenile salmonid field trapping manual. Fisheries and Marine Service MS Rep. 1530: 135p.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Bd. Canada 191: 382p.

Table 1. Smolt sampling data Lachmach River, Spring 1988. Ranges are shown in brackets.

Date	Number of Smolts	Mean Length (mm)	Mean Weight (g)	Mean Eye Diameter (mm)
April 27	12	89.42 (67-105)	6.57 (3.05-9.85)	6.20 (5.6-6.4)
April 28	28	84.18 (65-111)	5.65 (2.45-13.1)	6.27 (5.6-6.6)
April 29	40	89.70 (71-120)	6.65 (3.2-14.85)	6.39 (5.6-7.0)
April 30	44	86.00 (62-121)		6.19 (5.2-7.8)
May 1	95	89.19 (59-125)	6.61 (1.8-17.55)	6.34 (5.9-7.1)
May 2	34	89.50 (66-106)	6.55 (2.5-10.75)	6.34 (5.5-6.9)
May 3	27	89.85 (66-120)	6.81 (2.5-15.75)	6.52 (5.7-7.4)
May 4	64	94.80 (70-118)	7.95 (3.2-15.4)	6.55 (5.8-7.3)
May 5	88	95.07 (67-142)	8.08 (2.6-25.45)	6.58 (5.7-8.5)
May 6	179	94.14 (70-127)	7.74 (3.25-18.6)	6.24 (5.8-6.5)
May 7	415	93.02 (69-125)	8.33 (2.59-16.75)	6.12 (5.7-7.5)

Table 1 (con't)

Date	Number of Smolts	Mean Length (mm)	Mean Weight (g)	Mean Eye Diameter (mm)
May 8	290	95.29 (66-133)	8.84 (2.55-18.6)	6.28 (5.3-8.4)
May 9	697	94.60 (66-142)	7.68 (2.5-23.75)	6.52 (5.3-9.1)
May 10	677	94.92 (66-133)	6.96 (2.95-15.15)	6.35 (5.4-8.9)
May 11	1081	96.33 (63-132)	6.87 (2.3-11.8)	6.06 (5.6-6.6)
May 12	842	95.96 (67-189)	8.00 (3.75-31.45)	6.36 (5.8-9.0)
May 13	1191	96.83 (66-135)	8.53 (3.7-17.55)	6.26 (5.8-9.4)
May 14	701	95.43 (61-130	8.70 (3.65-16.1)	6.25 (5.9-7.2)
May 15	391	92.63 (64-188)	6.81 (3.3-13.75)	6.41 (5.7-8.5)
May 16	188	91.28 (70-133)		6.66 (5.9-8.9)
May 17	239	94.56 (70-187)	7.60 (3.7-14.35)	6.13 (6.0-6.3)
May 18	408	95.34 (61-136)	7.69 (2.8-14.65)	6.49 (5.9-8.5)

Table 1 (con't)

Date	Number of Smolts	Mean Length (mm)	Mean Weight (g)	Mean Eye Diameter (mm)
May 19	440	96.10 (68-125)	7.40 (3.25-15.75)	6.16 (5.8-6.8)
May 20	657	95.60 (69-132)	6.47 (3.25-20.45)	6.35 (5.5-9.0)
May 21	442	94.24 (70-135)	7.93 (3.55-22.1)	6.56 (5.6-8.8)
May 25	456	93.34 (63-124)		
May 26	73	94.58 (76-132)		6.26 (6.2-6.4)
May 27	46	93.24 (71-128)		6.05 (5.6-6.3)
May 28	66	93.30 (77-121)		6.26 (6.1-6.5)
May 29	19	87.68 (57-114)		
May 30	20	91.75 (73-116)		6.35 (5.9-8.1)
May 31	9	90.78 (82-188)		

Table 2. Retention of coded wire tags by large smolts after 24 hours, Lachmach River Spring 1988.

Date	Number Held	Number With Tag		Percent Retention
April 30	31	30		96.77
May 1	96	93		96.88
May 3	29	27		93.10
May 4	20	18		90.00
May 5	51	48		94.12
May 6	75	69		92.00
May 7	127	118		92.91
May 8	378	356		94.18
May 9	252	244		96.83
May 10	648	615		94.91
May 11	624	609		97.60
May 12	500	490		98.00
May 13	489	482		98.57
May 14	447	440		98.43
May 15	374	364		97.33
May 18	424	424		100.00
May 19	378	375		99.21
May 21	329	322		97.87
May 22	102	100		98.04
May 26	282	281		99.65
May 27	71	68		95.77
May 28	39	39		100.00
May 29	62	62		100.00
May 30	13	13		100.00
May 31	15	15		100.00
TOTAL	5856	5702	MEAN	96.89

Table 3. Retention of coded wire tags by small smolts after 24 hours, Lachmach River Spring 1988.

Date	Number Held	Number With Tag		Percent Retention
April 30	3	3		100.00
May 1	25	22		88.00
May 3	5	2		40.00
May 4	4	4		100.00
May 5	4	4		100.00
May 6	7	7		100.00
May 7	5	4		80.00
May 8	24	19		79.17
May 10	63	59		93.65
May 11	50	50		100.00
May 12	50	47		94.00
May 13	48	46		95.83
May 14	72	70		97.22
May 15	44	40		90.91
May 18	79	78		98.73
May 19	27	23		85.19
May 20	35	35		100.00
May 21	37	37		100.00
May 22	37	36		97.30
May 26	130	130		100.00
May 27	3	3		100.00
May 28	7	7		100.00
May 29	5	5		100.00
May 30	6	6		100.00
May 31	5	5		100.00
TOTAL	775	742	MEAN	93.60

Table 4. Sex composition of coho smolts collected at the Lachmach fence.

Sex	Mean Length (mm)	Mean Weight (g)	Number	Proportion
female	91.30	7.60	115	0.47
male	87.58	6.37	130	0.53

Table 5. Summary of data collected from other species trapped at the Lachmach smolt fence.

Species	Number	Mean Length (mm)	Mean Weight (g)
Cutthroat Trout	4	188.25	14.40
Dolly Varden	351	152.81	53.34
Oolichan	1	167.00	
Rainbow Trout	103	121.99	16.96
Cottid sp.	9	54.78	
Cottus asper	164	123.29	
Cottus aleuticus	2	115.00	

Table 6. Summary of Antigonish Creek sampling data, Spring 1988.

Date	N	Mean Length (mm)	Range (mm)
April 30	39	103.3	65 - 141
May 3	59	104.2	63 - 139
May 9	18	106.3	69 - 136
May 11	94	119.1	85 - 147
May 14	20	117.5	98 - 133
May 16	14	117.4	97 - 139

Table 7. Summary of Antigonish Creek Fyke net sampling data, Spring 1988.

Date	N	Mean Length (mm)	Range (mm)
May 11	14	116.6	56 - 139
May 13	26	121.3	97 - 144
May 14	35	127.1	103 - 146
May 15	20	119.9	70 - 150
May 16	19	123.2	73 - 148
May 17	10	117.4	97 - 130
May 18	36	108.8	67 - 133
May 19	41	116.8	65 - 143
May 21	30	111.7	70 - 130
May 22	56	115.9	66 - 146
May 23	22	118.9	72 - 142
May 24	28	97.5	61 - 142
May 31	12	94.0	70 - 142

Table 8. Migration numbers and timing of coho smolts from the Lachmach River and Antigonish Creek, Spring 1988.

Location	Total Number	Mean Length (mm)	Peak Date	Peak Number	Quartile Dates 25%	50%	75%
Lachmach River	9 983	95.0	May 13	1 190	May 10	May 13	May 18
Antigonish Creek	465	109.2	May 20	56	May 15	May 19	May 23

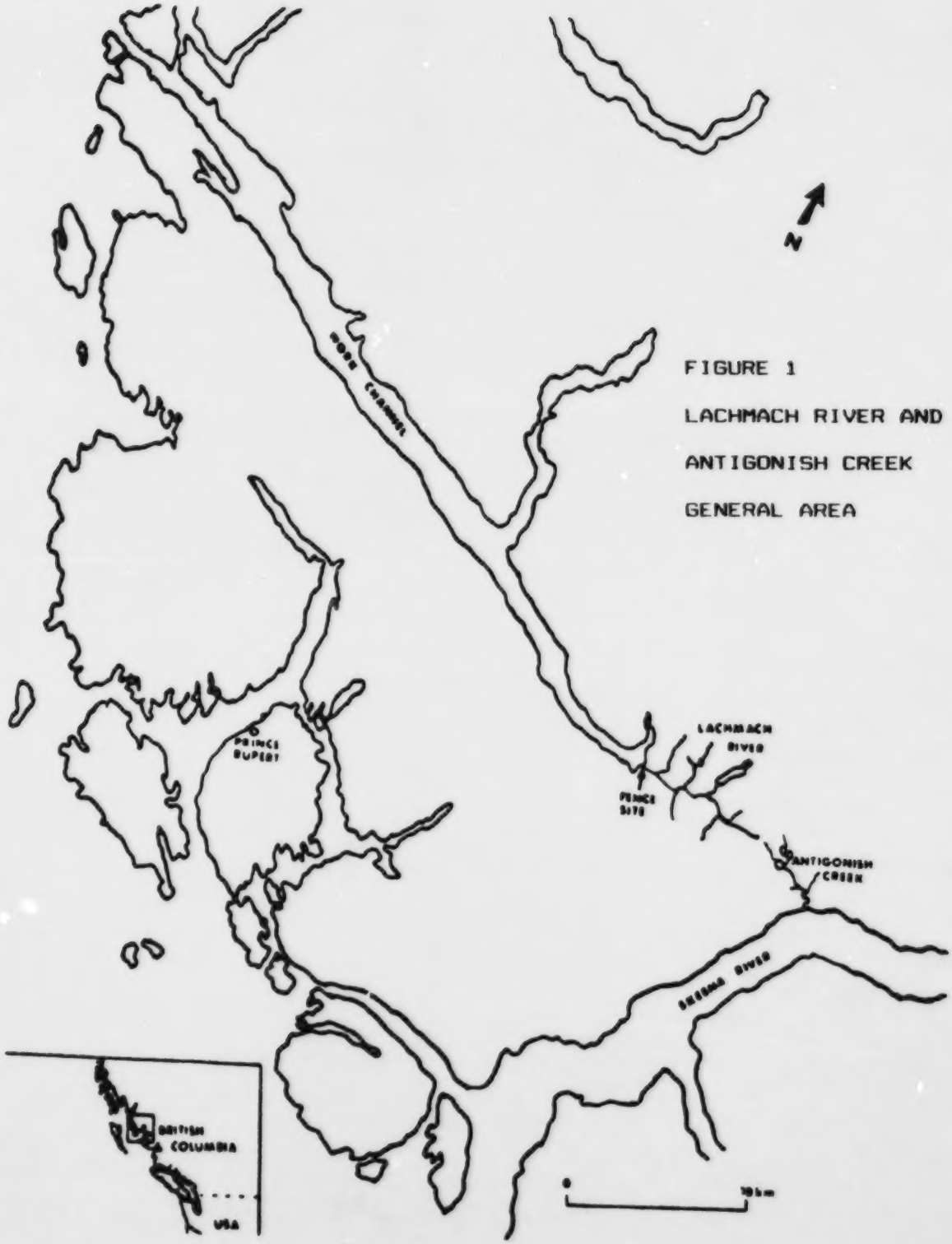


FIGURE 1

LACHMACH RIVER AND

ANTIGONISH CREEK

GENERAL AREA

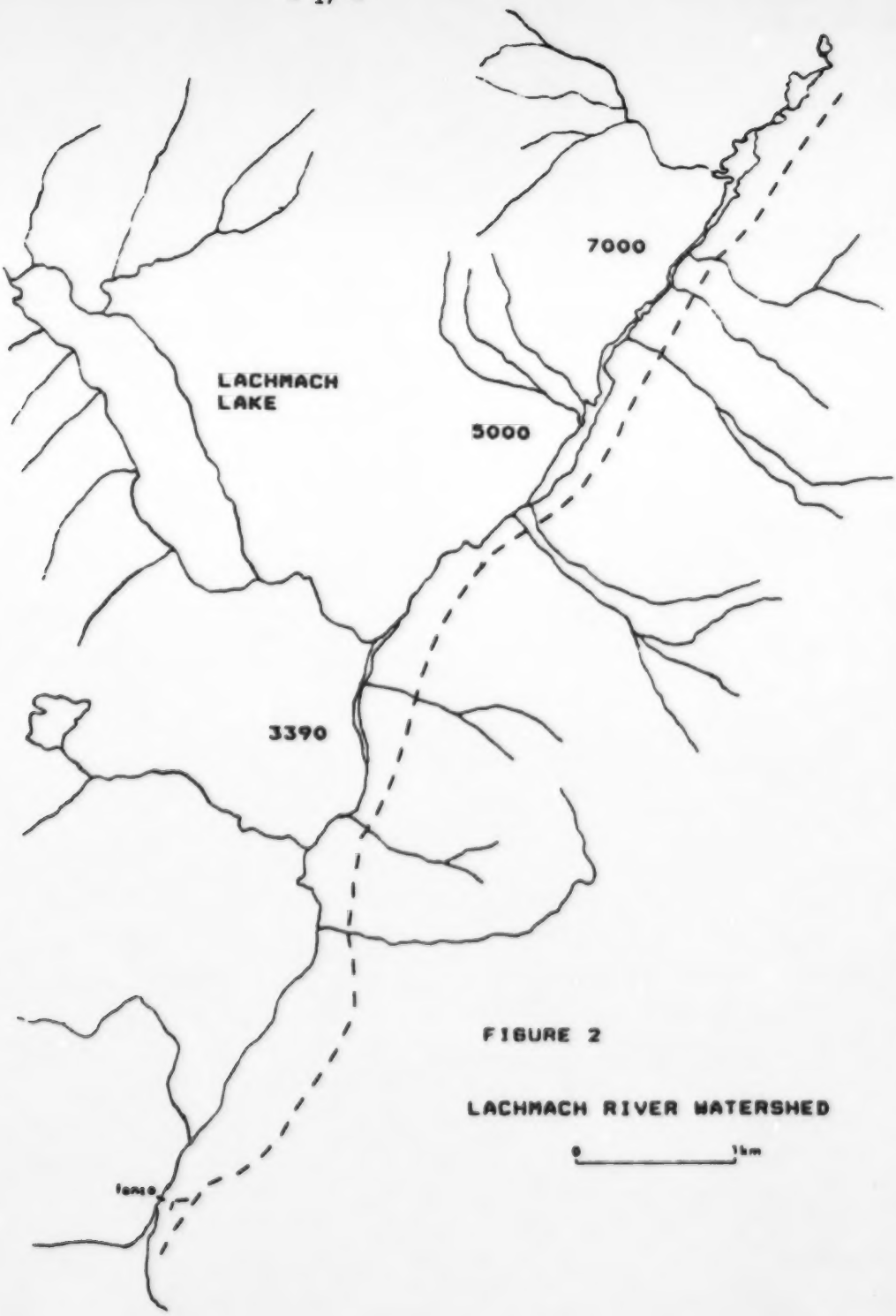


FIGURE 2

LACHMACH RIVER WATERSHED

Figure 3. Daily smolt captures Lachmach River Spring 1988.

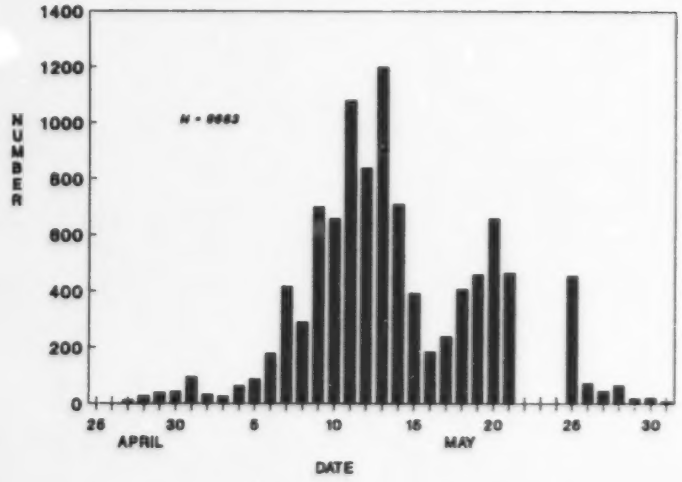


Figure 4. Length frequency of coho smolts Lachmach River Spring 1988.

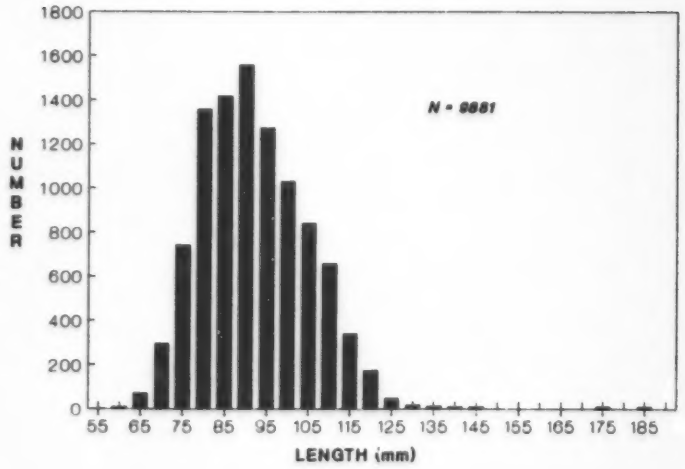


Figure 5. Length frequency of juvenile coho Lachmach River 3390 m pond April 1988.

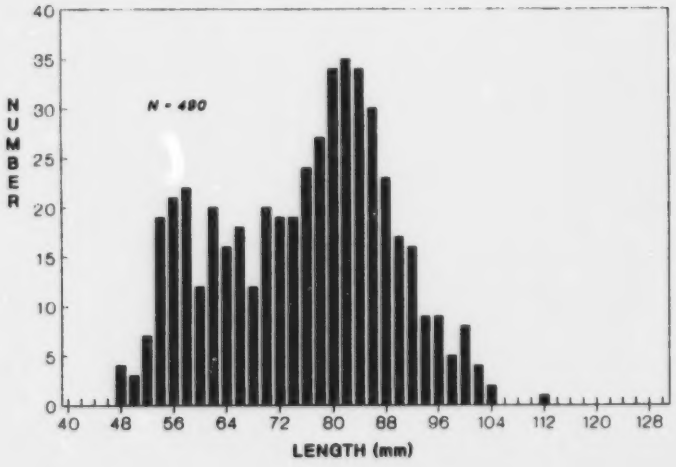


Figure 6. Length frequency of juvenile coho Lachmach River 5000 m pond April 1988.

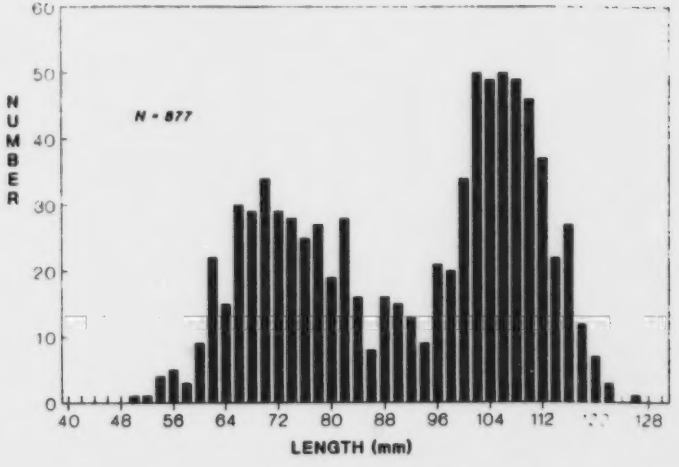


Figure 7. Length frequency of juvenile coho Lachmach River 5000 m pond May 30 1988.

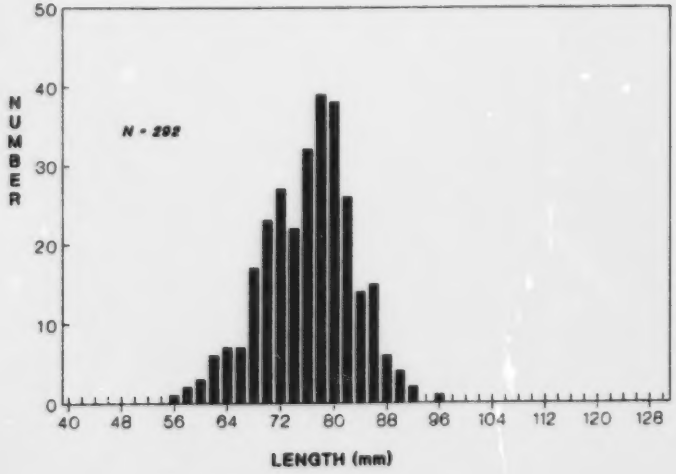


Figure 8. Length frequency of juvenile coho Lachmach River 7000 m pond March 1988.

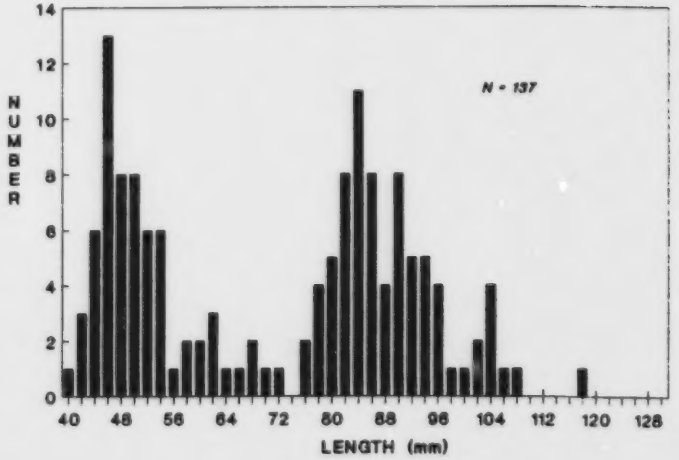


Figure 9. Daily maximum and minimum air temperatures Lachmach River Spring 1988.

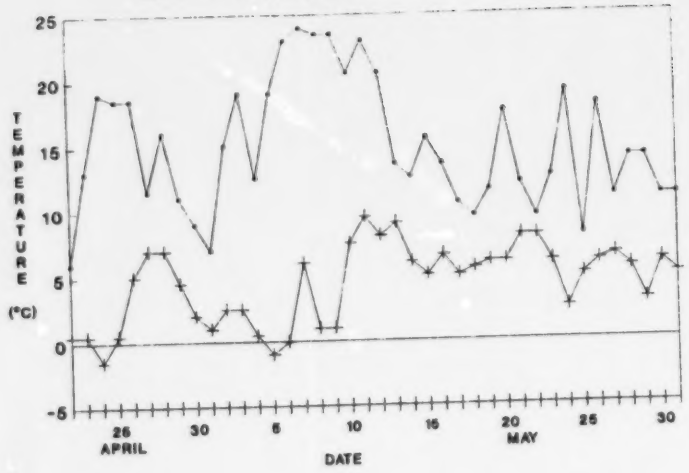


Figure 10. Mean daily water temperatures Lachmach River Spring 1988.

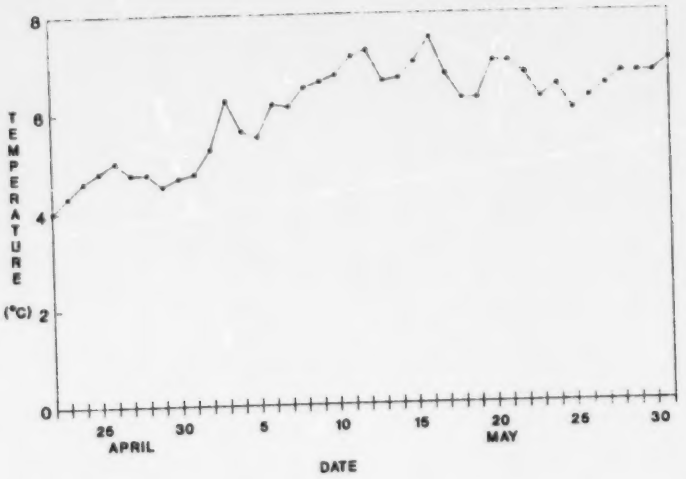
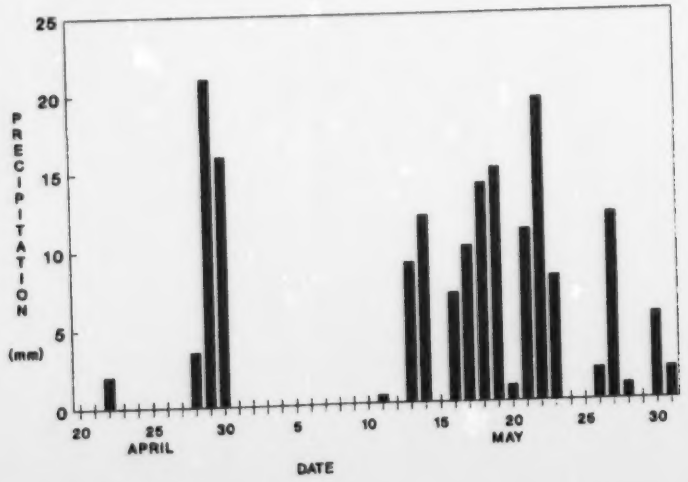


Figure 11. Daily precipitation Lachmach River Spring 1988.



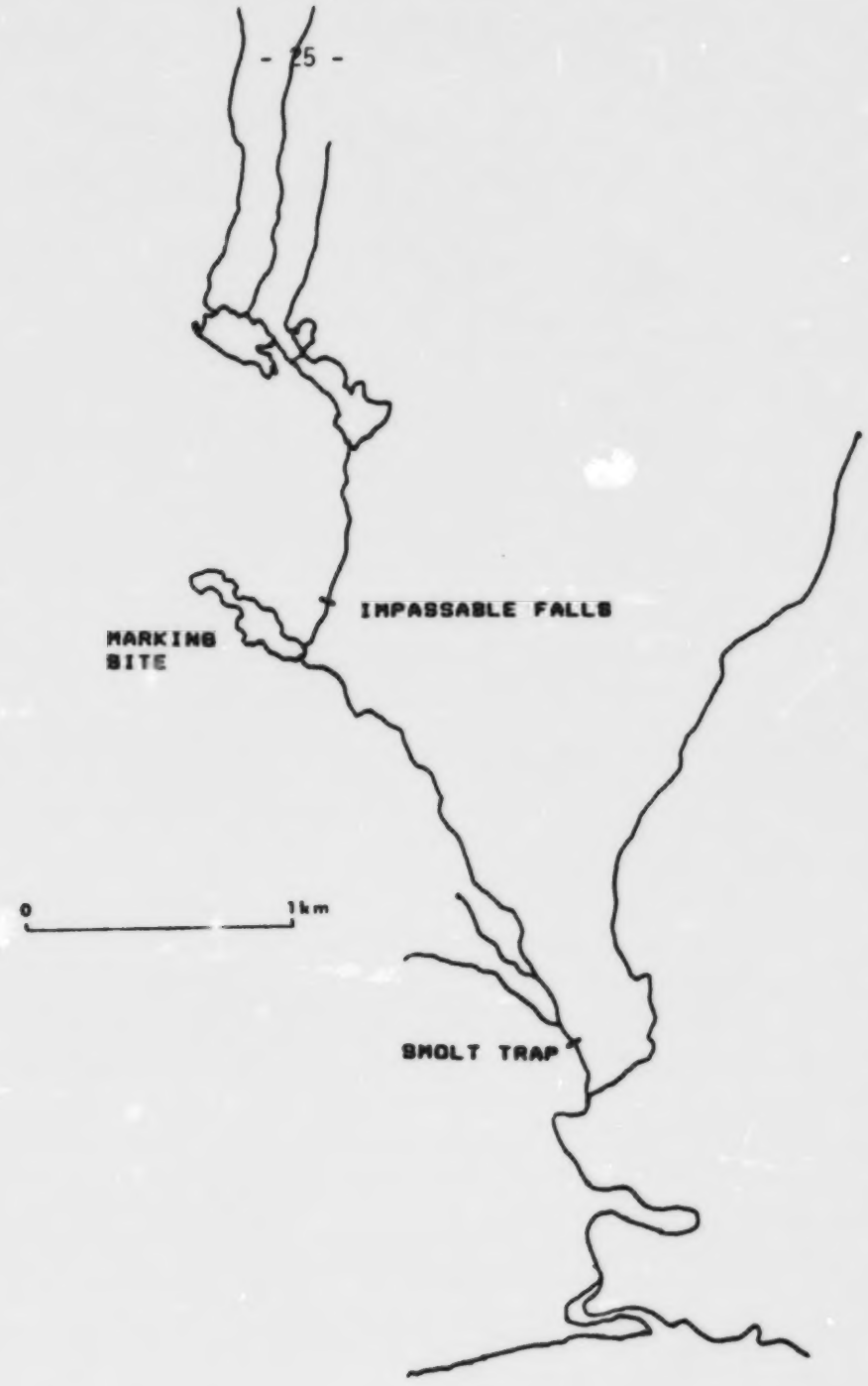


FIGURE 12. ANTIGONISH CREEK WATERSHED

Figure 13. Length frequency of coho juveniles Antigonish Creek pond April 1988.

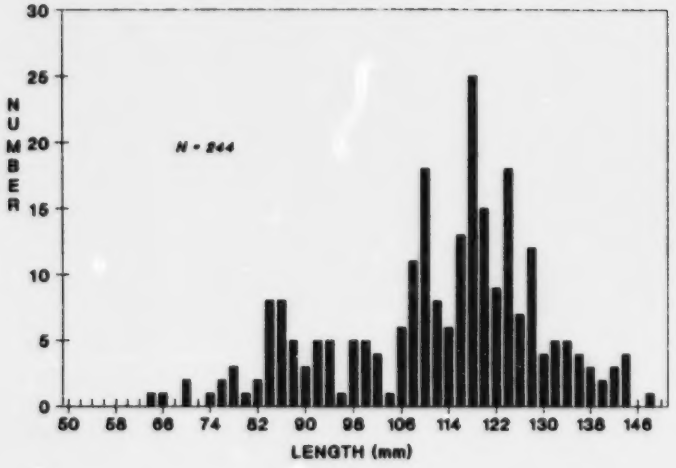


Figure 14. Length frequency of coho smolts Antigonish Creek Spring 1988.

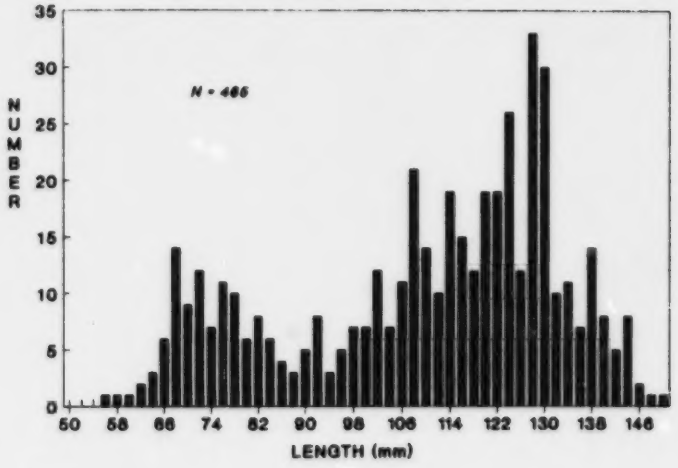
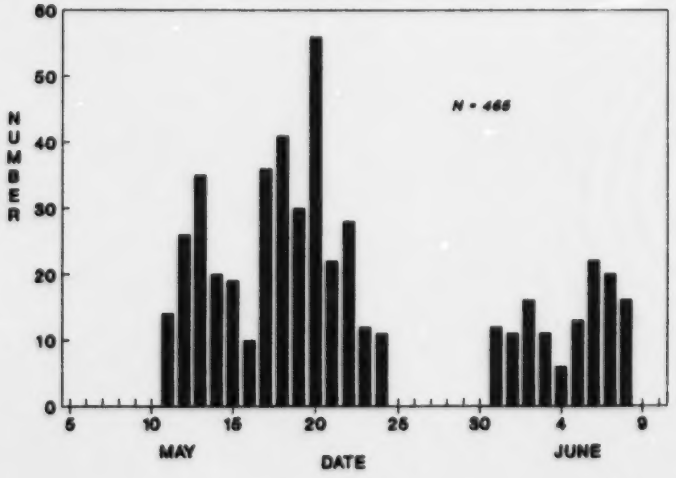


Figure 15. Daily smolt catch Antigonish Creek Spring 1988.



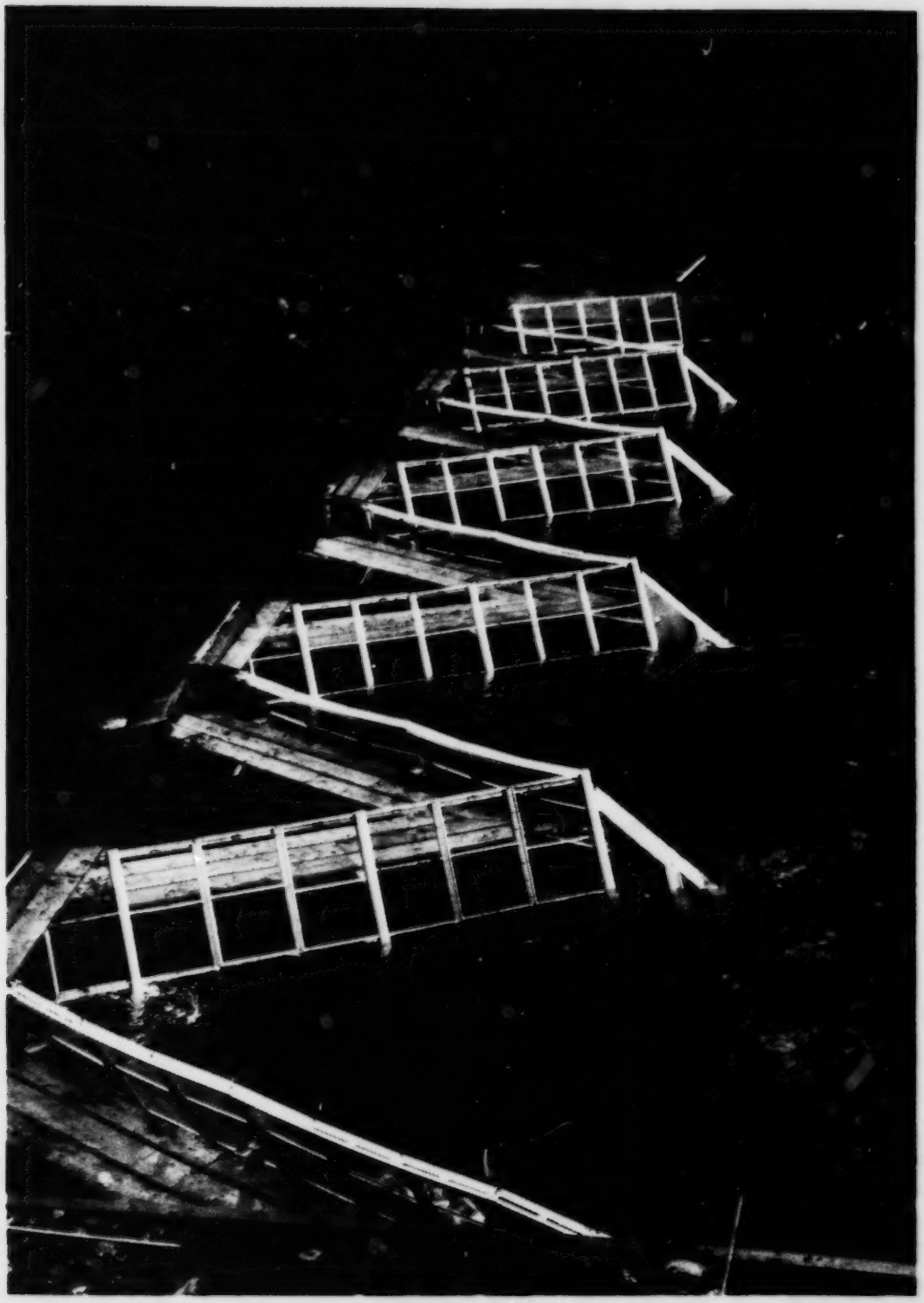


Plate 1. Lachmach River smolt trapping fence.